NASA Cost Estimating Symposium

Multivariable Spacecraft Cost Model

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TOTAL SPACECRAFT BUS COST MODEL
Cost Drivers

ARRAYAREA Solar Array in square feet.

BUSTRL Bus Technology Readiness Level (TRL). This is the overall TRL for the bus and is a composite rating for all the subsystems. The value ranges from 1 to 9. Guidance in selecting the bus TRL is given in the Table of Characteristics for Evaluating TRLs.

BUSWT Bus Weight in pounds. This is the weight of all the subsystems.

DUR Project Duration in months. This is the duration from Authority to Proceed (ATP) on the spacecraft to launch.

TOTAL SPACECRAFT BUS COST MODEL
Cost Drivers

MATERIAL   Structural Material Complexity. This is the level of complexity associated with the type of material used in the bus structure. The material complexity value needs to be obtained from the table below.

MATERIAL COMPLEXITIES

Aluminum
Aluminum Honeycomb
Magnesium
Simple Alloys
Fiberglass
Titanium/Berylium
Graphite/Epoxy
Boron

NUMINST   Number of instruments in the payload.

TOTAL SPACECRAFT BUS COST MODEL
Cost Drivers

RELIAB NASA Reliability Classification Complexity for the bus. This is a weighted complexity value that needs to be obtained from the table below.

NASA RELIABILITY
CLASSIFICATION COMPLEXITIES

D
C
B
A
Manned

TOTAL SPACECRAFT BUS COST MODEL
Cost Drivers

SATWT   Satellite Weight in pounds. This is the dry satellite weight consisting of the spacecraft bus and instrument payload.

STABIL   Spacecraft Stabilization Complexity. This is the level of complexity associated with the stabilization method. The stabilization complexity value needs to be obtained

                    STABILIZATION COMPLEXITIES

                    Spin
                    3-Axis
                    Spin with Despun Platform (Dual Spin)

WATTS   Maximum Watts. This is the maximum beginning-of-life power in watts provided by the solar array for use by the satellite, bus and instruments.

TOTAL SPACECRAFT BUS COST MODEL
MODEL OVERVIEW

- Cost estimating relations (CERs) estimate the total spacecraft bus cost.

- Total spacecraft bus cost consists of the costs of subsystems and system level activities.

- CERs express the full protoflight costs of nonrecurring and recurring activities to provide a flight ready spacecraft bus.

- The following costs are excluded:
  Instrument Payload
  Mission System Integration and Test (MSI&T)
  Ground System

TOTAL SPACECRAFT BUS COST MODEL
MODEL OVERVIEW

- Total Spacecraft Bus Cost Model:
   Small Missions (<1200 lb. Satellite Weight)
   Large Missions (≥1200 lb. Satellite Weight)
   All Missions

- Use bus dry weight or satellite dry weight along with other cost drivers to estimate the total bus cost.

- No-Weight approach introduces additional cost drivers as an additional estimating tool.

- No-Weight approach may be useful in making design-cost trades.